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United States Department of Agriculture.

BUREAU OF FORESTRY Circular No. 31.

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EXHIBIT OF A FOREST NURSERY AT THE LOUISIANA PURCHASE EXPOSITION.

A demonstration forest nursery forms part of the outdoor exhibit of the Bureau of Forestry at the Louisiana Purchase Exposition. It contains about 8,100 square feet, 4,500 of which is devoted to coniferous and the remainder to broadleaf trees.

The land selected for the nursery is the higher part of the outdoor space assigned to the Bureau. Its natural advantages are that there is enough slope to allow good drainage, without much danger of wash. It has the disadvantage that the soil—the heavy clay so common about St. Louis—is not well adapted for a nursery. The whole area was plowed late last fall, and harrowed as early in the spring as the unfavorable weather permitted.

CONIFEROUS NURSERY.

The purpose of the coniferous seed beds is to show various methods of seeding, and different kinds of screens for securing suitable shade for the different species. Four methods of seeding have been used, namely, broadcasting over the whole bed, broadcasting in strips 6 or 8 inches wide, sowing in single drills, and sowing in double drills. Before planting, the beds were thoroughly spaded and the earth fined.

The chief advantage of the broadcast method is that a larger number of seedlings can be raised by it on a given area than by any other method. Broadcasting in strips is a compromise between the drill and broadcasting methods, and combines the merits of both. The seeds sown broadcast were pressed into the soil to the depth of their own thickness, while the drills were made one-eighth to one-fourth of an inch deep, and in case of the larger seeds somewhat deeper. Where the method of broadcasting in strips is used a space 6 inches wide is left between the seeded strips, to allow cultivation by a narrow hoe. The same object is obtained by sowing in drills. The single drills and the couplets of the double drills are 6 inches apart, while the members of the couplets are 3 inches apart. All beds were covered with a mulch of Mississippi River sand to a depth of one-eighth to one-fourth inch.

The beds, which extend in a north and south direction, are 4 feet wide, and are divided into lengths usually of 6 feet. All drills and strips sown broadcast extend lengthwise of the bed. The width of 4 feet was chosen not only because it is a convenient width for weeding, but also because laths, which form the covering of most of the screens, are of this length.

Most of the screens rest on uprights 1 foot above the ground and consist of a frame of 3 by 1 inch rough lumber, covered with laths or cheesecloth. Undressed lumber was chosen because the purpose of the exhibit is to show practical methods adapted to the needs of farmers. The cheesecloth is used for the same reason.

In some cases the cheese cloth is a single thickness and in others double, to vary the amount of shade afforded. The spacing of the laths varies from the two-thirds shade, in which the laths are five-eighths inch apart, to the one-third shade, in which they are 3 inches apart. Between these extremes is the one-half shade, which is made by covering the frame with the laths, nailing only the alternate laths, and then shaking out the loose laths. Besides these is shown a screen covered with laths nailed on edge, with a spacing corresponding to one-fourth shade. Since the width of the laths stands vertically, the shade varies with the slant of the sun's rays. One advantage of this screen is that the tender seedlings are protected from the direct force of severe rains, the raindrops usually striking the laths diagonally. Besides the screens above described there are a number of screens attached to posts 4 feet high, by hinges at an elevation of 1 foot. These screens can be raised to a perpendicular position, in case of long-continued wet weather, to allow the seed beds to dry out. Figure 1 illustrates the method of constructing the hinged screens.

The amount of light allowed is an essential factor in the successful raising of coniferous seedlings. This should vary with the demands of the species, which may best be judged from the natural conditions in which the seedlings grow. Some varieties of trees, as the spruces, admit of much more shade than others, such as the pines. Trees native in the North are accustomed to a denser shade than those grown in the Southwest, and this fact must be borne in mind in raising the trees from seed. Below is a list of the species used in this nursery, arranged according to their relative tolerance of shade, the most tolerant being named first:

Norway spruce, white fir, bigcone spruce, red fir, lodgepole pine, jack pine, white pine, Chinese arborvitæ, western yellow pine, Sabine pine, knobcone pine, Coulter pine, piñon, single-leaf pine.

Screens of varying degrees of shade for each species are used in the nursery to show with what amount of shade each species does best.

There are eight coniferous seed beds, varying in length from 65 feet, the most eastern, to 50 feet, the most western bed. The following tabulation shows the beds in which the various species occur, the methods of seeding, and the amount of shade given to each species.

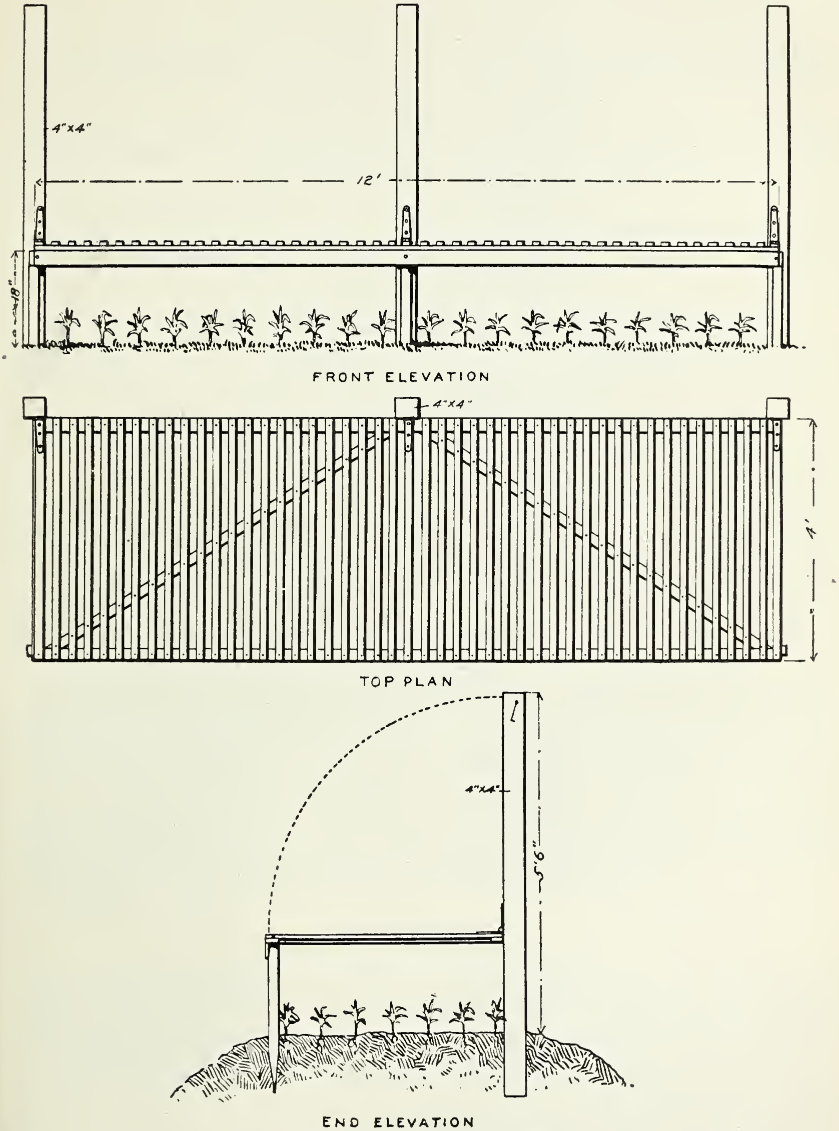

Fig. 1.—Design of hinged nursery screen.

Seed bed I.

Species.	Method of sowing.	Length of 4-foot bed in feet.	Kind of screens.
Norway spruce (*Picea excelsa*)	Broadcast	12	One-half, two-thirds.
	Single drills	7	
	Double drills	6	
White fir (*Abies concolor*)	Broadcast	6	One-half, two-thirds, one thickness of cheesecloth.
	Broadcast in strips	4	
	Single drills	3	
	Double drills	3	
Chinese arborvitæ (*Biota orientalis*).	Broadcast	6	Vertical lath, one-half, one-third, one thickness of cheesecloth.
	Broadcast in strips	6	
	Single drills	6	
	Double drills	6	

Seed bed II.

Red fir (*Pseudotsuga taxifolia*)	Single drills	6	One-half, one-third.
	Double drills	6	
	Broadcast	6	
Lodgepole pine (*Pinus murrayana*).	Single drills	6	One-half, one-third.
	Broadcast	6	
	Broadcast in strips	6	
Piñon (*Pinus edulis*)	Single drills	12	One-half, one-third, vertical lath.
	Broadcast in strips	6	
Single-leaf pine (*Pinus monophylla*).	Single drills	10	One-third, vertical lath.

Seed bed III.

Jack pine (*Pinus divaricata*)	Broadcast	18	Double thickness of cheesecloth, vertical lath, one-half, one-third.
	Single drills	18	
Single-leaf pine (*Pinus monophylla*).	Broadcast	6	Vertical lath and one-third.
	Broadcast in strips	6	
	Single drills	6	
	Double drills	6	

Seed bed IV.

Western yellow pine (*Pinus ponderosa*).	Single drills	18	One-half, one-third, vertical lath, one thickness of cheesecloth and two sections without shade.
	Double drills	12	
	Broadcast	18	
	Broadcast in strips	12	

Seed bed V.

White pine (*Pinus strobus*)	Single drills	12	One-half, two-thirds, one thickness of cheesecloth.
	Broadcast	12	
	Double drills	6	
	Broadcast in strips	6	
Western yellow pine and piñon transplants.	Single rows	21	One-third, one thickness of cheesecloth.

Seed bed VI.

Species.	Method of sowing.	Length of 4-foot bed in feet.	Kind of screens.
Coulter pine (*Pinus coulteri*)	Single drills	6	Vertical lath, one thickness of cheesecloth, one-third.
	Double drills	12	
	Broadcast	6	
	Broadcast in strips	12	
Sabine pine (*Pinus sabiniana*)	Single drills	6	Vertical lath, one thickness of cheesecloth, one-third.
	Double drills	6	
	Broadcast	6	

Seed bed VII.

Bigcone spruce (*Pseudotsuga macrocarpa*)	Single drills	12	One-half, two-thirds, one thickness of cheesecloth.
	Double drills	12	
	Broadcast	12	
	Broadcast in strips	12	

Seed bed VIII.

Knobcone pine (*Pinus attenuata*)	Single drills	18	One-third, one-half, one thickness of cheesecloth, double thickness of cheesecloth.
	Double drills	18	
Lodgepole pine (*Pinus murrayana*)	Double drills	12	One-half, one-third.
	Broadcast	6	

In addition to the eight seed beds above described, there is one short bed of coniferous transplants. Western yellow pine and piñon transplants, which were grown in a nursery at Halsey, Nebr., are set out in parallel lines a foot apart in bed V, the plants being 2 or 3 inches apart. Longleaf, loblolly, and shortleaf pine transplants are set out in the same way in the short bed above mentioned. These were secured from the forests of Texas and Indian Territory.

DECIDUOUS NURSERY.

The broadleaf species are planted in beds and rows running east and west. Beginning at the south the first row, 100 feet long, is planted with black walnut. The nuts were planted at a depth of 2 or 3 inches about the middle of April, after having been stratified[a] for the previous month. In the next row there is a single line 27 feet long of chestnut oak, grown from acorns which were gathered from the ground in March and received the same treatment as the walnuts, and in addi-

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[a] Stratification is a method used by nurserymen to keep seeds moist and prepare them for germination, before the time of planting. The seeds are placed in a bag or box mixed with sand and are buried to a depth of a foot or so in a well-drained situation. A sandy soil is preferable.

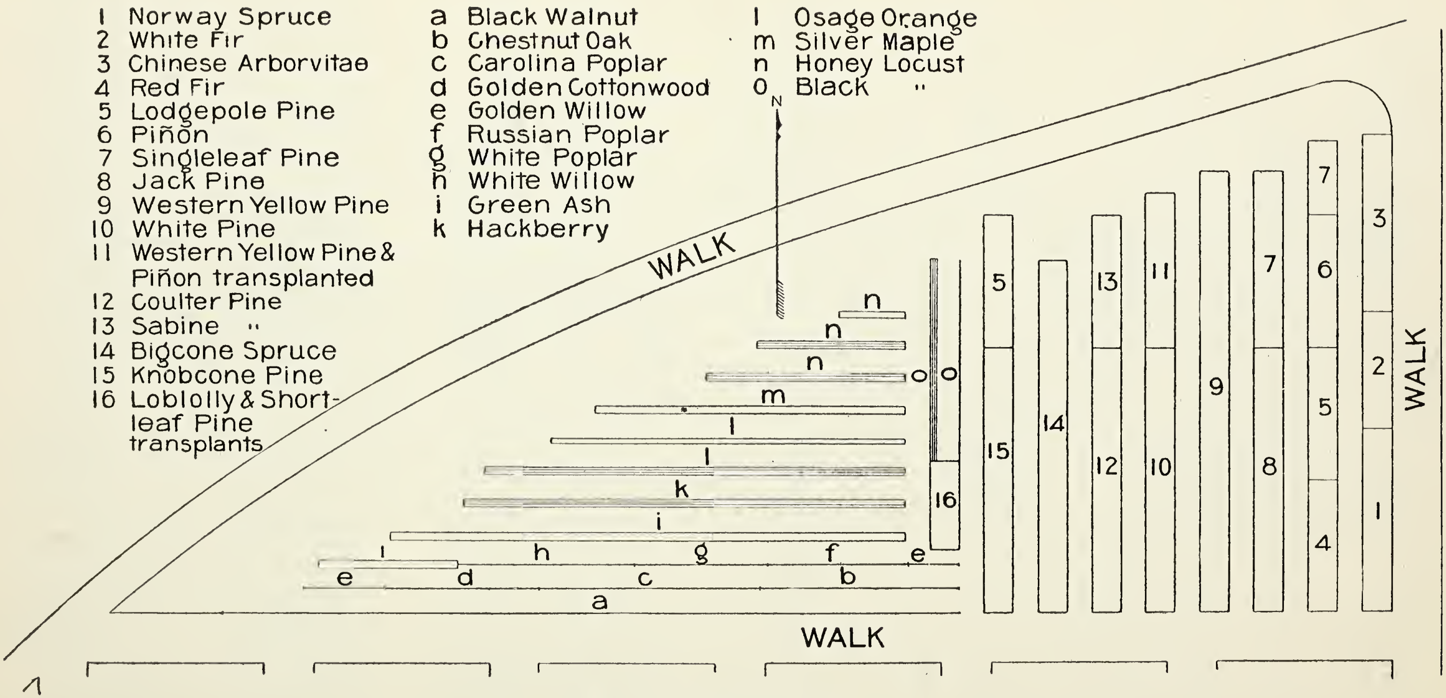

FIG. 2.—Detailed plan of nursery.

tion to the oak 30 feet of Carolina poplar, 21 feet of golden cottonwood, and 11 feet of golden willow, all grown from cuttings.

In the third row are 7 feet of golden willow, 19 feet of Russian poplar (*Populus certinensis*), 18 feet of white poplar, and 24 feet of white-willow, all cuttings, besides 19 feet of green ash seedlings. All the poplars and willows are cuttings taken from trees in Minnesota early in the past spring. They were planted in single rows, leaving an inch or more of the ends of the cuttings exposed above the soil.

The fourth bed is a seed bed 70 feet long and 1 foot wide, planted to green ash. The soil was fined and the seeds sown broadcast, and the bed was then covered with loose soil to a depth of 1 inch.

The fifth bed consists of four parallel rows 3 inches apart and 60 feet long, planted to hackberry, and the sixth of four parallel rows 3 inches apart and 57 feet long, planted to Osage orange.

The seventh bed is 48 feet long and 8 inches wide. Osage orange was sown broadcast over this bed, which received the same treatment as the ash bed.

Silver maple was planted broadcast over the eighth bed, which is 42 feet long and 1 foot wide. The ninth and tenth beds, respectively 27 and 20 feet long, are both devoted to quadruple rows of honey locust, 3 inches apart. The eleventh and most northern bed, 9 feet long and 10 inches wide, was sown broadcast to honey locust.

Between the coniferous and broadleaf sections of the nursery, and just north of the southern pine transplants, is a bed of quadruple rows and also a single row of black locust, 20 feet long. The seeds of both black and honey locust were treated with hot water and allowed to soak two or three days before planting.

Approved.
JAMES WILSON,
Secretary.
WASHINGTON, D. C., *July 20, 1904.*

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